

MITHA TIWANA

# Numericals

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CLASS: 9<sup>th</sup> / 10<sup>th</sup>

WEIGHT  
AGAINST 1



## NUMERICAL:9

### CHAPTER # 01

Exp: 1, 2, 4

(a)  $5000g$  1.1

$= 5 \times 10^3 g$

$= 5kg$

(b)  $2000000W$

$= 2 \times 10^6 W$

$= 2MW$

(c)  $52 \times 10^{-10} kg$

$= 52 \times 10^{-10} \times 10^3 g$

$= 52 \times 10^{-7} g$

$= 5.2 \times 10^{-6} g$

$= 5.2 \mu g$

(d)  $225 \times 10^{-10} s$

$= 2.25 \times 10^{-8} s$

$= 2.25 \mu s$  1.2

$1p = 10^{-12}$  /  $1n = 10^{-9}$

$1u = 10^{-6}$  /  $1u = 10^3 n$

$1n = 10^3$  /  $1u = 10^6 p$

بال بڑھنے کی شرح 1.3

$= V = d/t$

$= 1mm/1 \text{ day}$

$= 1 \times 10^{-3} / 86400$

$= 1.157 \times 10^{-5} \times 10^{-3}$

$= 1.157 \times 10^{-8}$

$= 11.57 \times 10^{-9}$

$= 11.57 nm/s$

(a)  $1168 \times 10^{-27}$  1.4

$= 1.168 \times 10^{-27+3}$

$= 1.168 \times 10^{-24}$

(b)  $32 \times 10^5$

$= 3.2 \times 10^{5+1}$

$= 3.2 \times 10^6$

(c)  $725 \times 10^{-5} kg$

$= 725 \times 10^{-5} \times 10^3 g$

$= 725 \times 10^{-2} g$

$= 7.25 g$

(d)  $0.02 \times 10^{-8}$

$= 2 \times 10^{-8-2}$

$= 2 \times 10^{-10}$

(a)  $6400 km$  1.5

$= 6.4 \times 10^3 km$

(b)  $380000 km$

$= 3.8 \times 10^5 km$

(c)  $300000000 m/s$

$= 3 \times 10^8 m/s$

(d) ایک دن میں سیکنڈ =

$24 \times 60 \times 60 s$

$= 86400 s$

$= 8.64 \times 10^4 s$

زیر دایرہ  $= 0.01 \times 4$  1.6

$= 0.04 cm$

زیر و کوریکشن  $= -0.04 cm$

درجوں کی تعداد  $= 50$  1.7

سکریو کی چم  $= 0.5 mm$

L.C = درجے/چم

$= 0.5/50$

$= 0.01 cm$

$0.00309 kg = 3$  1.8

$5.05 \times 10^{-27} = 3$

$1.009 m = 4$  1.9

$0.00450 kg = 3$

$1.66 \times 10^{-27} kg = 3$

$2001 s = 4$

لمبائی  $= 6.7 cm$  1.10

چوڑائی  $= 5.4 cm$

رقبہ  $= L \times W = 6.7 \times 5.4$

$= 36.78 cm^2$

$= 36 cm^2$

### CHAPTER # 02

Exp: 2, 3, 4, 5, 10, 11

$V = 36 km/h$  2.1

$= 36 \times 1000 m / 3600$

$V = 10 m/s$

$t = 10 s$

$S = Vt$

$= 10 \times 10$

$= 100 m$

$V_i = 0$  2.2

$S = 1000 m$

$t = 100 s$

$V_f = ?$

$S = V_i t + \frac{1}{2} a t^2$

$10^3 = 0 \times 100 + \frac{1}{2} a \times (100)^2$

$a = 0.2 m/s^2$

$V_f = V_i + at$

$= 0 + 0.2 \times 100$

$= 20 m/s$

$V_i = 10 m/s$  2.3

$a = 0.2 m/s^2$

$t = 30 s$

$S = ?$

$V_f = ?$

$V_f = V_i + at$

$= 10 + 0.2 \times 30$

$= 10 + 6 = 16 m/s$

$S = V_i t + \frac{1}{2} a t^2$

$= 10 \times 30 + \frac{1}{2} \times 0.2 \times (30)^2$

$= 300 + \frac{1}{2} \times 0.2 \times 900$

$= 300 + 90$

$= 390 m$

$V_i = 30 m/s$  2.4

$V_f = 0$

$g = -10 m/s^2$

$h = ?$

$2gh = V_f^2 - V_i^2$

$2(-10)h = (0)^2 - (30)^2$

$-20h = -900$

$h = -900/-20$

$h = 45 m$

واپسی کا ٹائم  $= t = 3 s$

پانچ سیکنڈ میں طے فاصلہ 2.5

$V_i = 40 m/s$

$t = 5 s$

$S_1 = V_i t$

$S_1 = 40 \times 5$

$= 200 m$

دس سیکنڈ میں طے فاصلہ

$V_i = 40 m/s$

$V_f = 0$

$t = 10 s$

$V_{av} = V_f + V_i / 2$

$= 0 + 40 / 2$

$= 20 m/s$

$S_2 = V_i t$

$S_2 = 20 \times 10$

$= 200 m$

کل فاصلہ  $= S_1 + S_2$

$= 200 + 200$

$= 400 m$

ڈسپلین

$a_{av} = V_f - V_i / t$

$= 0 - 40 / 10 = -40 / 10$

$= -4 m/s^2$

$V_i = 0$  2.6

$a = 0.5 m/s^2$

$S = 100 m$

$V_f = ?$

$2aS = V_f^2 - V_i^2$

$2(0.5)100 = V_f^2 - (0)^2$

$V_f^2 = 100$

$V_f = 10 m/s^2$

$V_f = 10 \times 3600 / 1000$

$V_f = 36 km/h$

دو منٹ میں طے فاصلہ 2.7

$V_i = 0$

$V_f = 48 km/h$

$= 13.33 m/s$

$t = 2 \text{ mint} = 2 \times 60$

$= 120 s$

$V_{av} = V_f - V_i / 2$

$= 0 + 13.33 / 2$

$= 6.66 m/s$

$S_1 = V_{av} t$

$= 6.66 \times 120$

$= 800 m$

پانچ منٹ میں طے فاصلہ

$V = 13.33 m/s$

$t = 5 \text{ mint} = 5 \times 60$

$= 300 s$

$S_2 = Vt$

$= 13.66 \times 300$

$= 4000 m$

تین منٹ میں طے فاصلہ

$V_i = 13.66 m/s$

$V_f = 0$

$t = 3 \text{ mint} = 3 \times 60$

$= 180 s$

$V_{av} = V_f + V_i / 2$

$= 0 + 13.66 / 2$

$= 6.66 m/s$

$S_3 = V_{av} t$

$= 6.66 \times 180$

$= 1200 m$

کل فاصلہ  $= S_1 + S_2 + S_3$

$= 800 + 4000 + 1200$

$= 6000 m$

اوپر جانے کا وقت 2.8

$t = 6 / 2 = 3 s$

$g = -10 m/s^2$

$V_f = 0$

$h = ?$

$V_i = ?$

$V_f = V_i + gt$

$0 = V_i + (-10) \times 3$

$V_i = 30 m/s$

$2gh = V_f^2 - V_i^2$

$2(-10)h = (0)^2 - (30)^2 - 20 \times h = -900$

$h = -900 / -20$

$= 45 m$

$S = 800 m$  2.9

$V_i = 96 km/h$

$= 26.67 m/s$

$V_f = 48 km/h$

$= 13.33 m/s$

$a = ?$

$2aS = V_f^2 - V_i^2$

$2a800 = (13.33)^2 - (26.67)^2$

$1600a = 177.68 - 711.28$

$a = -533.6 / 1600$

$= -0.3335 m/s^2$

اس ایکسپریشن سے طے فاصلہ

$V_i = 13.33 m/s$

$V_f = 0$

$a = -0.3335 m/s^2$

$S = ?$

$2aS = V_f^2 - V_i^2$

$2(-0.3335)S = (0)^2 - (13.33)^2$

$0.667 \times S = -177.66$



$$S = -177.66/-0.667$$

$$S = 266.4m$$

$$V_i = 26.67m/s \quad [2.10]$$

$$V_f = 0$$

$$a = -0.3335m/s^2$$

$$V_f = V_i + at$$

$$t = (V_f - V_i)/a$$

$$t = 0 - 26.67/-0.3335$$

$$t = 80s$$

## CHAPTER # 03

Exp: 1, 2, 3, 6, 7, 8

$$F = 20N \quad [3.1]$$

$$a = 2m/s^2$$

$$F = ma$$

$$m = F/a$$

$$= 20/2$$

$$= 10kg$$



$$W = 147N \quad [3.2]$$

$$g = 10m/s^2$$

$$W = mg$$

$$m = W/g$$

$$= 147/10$$

$$= 14.7kg$$

$$m = 10kg \quad [3.3]$$

$$g = 10m/s^2$$

$$W = mg \rightarrow F$$

$$= 10 \times 10$$

$$= 100N$$

$$F = 100N \quad [3.4]$$

$$m = 50kg$$

$$F = ma$$

$$a = F/m$$

$$= 100/50$$

$$= 2m/s^2$$

$$W = 20N \quad [3.5]$$

$$a = 2m/s^2$$

$$g = 10m/s^2$$

$$W = mg$$

$$m = W/g$$

$$= 20/10$$

$$= 2kg$$



$$F = ma$$

$$= 2 \times 2 = 4N$$

ساری فورس =  $W + F$

$$F = 20 + 4$$

$$= 24N$$

$$m_1 = 52kg \quad [3.6]$$

$$m_2 = 48kg$$

$$g = 10m/s^2$$

$$a = \frac{(m_1 - m_2)g}{m_1 + m_2}$$

$$= (52 - 48) \times 10 / 52 + 48$$

$$= 4 \times 10 / 100 = 40/100$$

$$a = 0.4m/s^2$$

$$T = \frac{2m_1m_2g}{m_1 + m_2}$$

$$= 2 \times 52 \times 48 \times 10 / 100$$

$$= 49920 / 100$$

$$T = 500N$$

$$m_1 = 24kg \quad [3.7]$$

$$m_2 = 26kg$$

$$g = 10m/s^2$$

$$a = \frac{m_1g}{m_1 + m_2}$$

$$= 24 \times 10 / 24 + 26$$

$$a = 240/50$$

$$= 4.8m/s^2$$

$$T = \frac{m_1m_2g}{m_1 + m_2}$$

$$= 24 \times 26 \times 10 / 24 + 26$$

$$T = 6240/50$$

$$= 125N$$

$$\Delta P = 22Ns \quad [3.8]$$

$$F = 20N$$

$$F = \Delta P/t$$

$$t = \Delta P/F$$

$$= 22/20$$

$$t = 1.1s$$

$$m = 5kg \quad [3.9]$$

$$\mu = 0.6$$

$$F_s = \mu F = \mu mg$$

$$F_s = 0.6 \times 5 \times 10$$

$$= 30N$$

$$m = 0.5kg \quad [3.10]$$

$$r = 50cm$$

$$r = 50/100$$

$$= 0.5m$$

$$V = 3m/s$$

$$F_c = mV^2/r$$

$$= 0.5 \times (3)^2 / 0.5$$

$$= 9N$$

## CHAPTER # 04

Exp: 1, 2, 5

$$F_x = 10 - 4 = 6N \quad [4.1]$$

$$F_y = 6N$$

$$F = \sqrt{F_x^2 + F_y^2}$$

$$F = \sqrt{6^2 + 6^2}$$

$$F = \sqrt{72} = 8.5N$$

$$\theta = \tan^{-1}(F_y/F_x)$$

$$\theta = \tan^{-1}(6/6)$$

$$\theta = \tan^{-1}(1)$$

$$= 45^\circ$$

$$F = 50N \quad [4.2]$$

$$\theta = 30^\circ$$

$$F_x = F \cos \theta$$

$$= 50 \cos 30^\circ$$

$$= 50 \times 0.866$$

$$= 43.3N$$

$$F_y = F \sin \theta$$

$$= 50 \sin 30^\circ$$

$$= 50 \times 0.5$$

$$= 25N$$



$$F_x = 12N \quad [4.3]$$

$$F_y = 5N$$

$$F = \sqrt{F_x^2 + F_y^2}$$

$$F = \sqrt{12^2 + 5^2}$$

$$F = \sqrt{169} = 13N$$

$$\theta = \tan^{-1}(F_y/F_x)$$

$$\theta = \tan^{-1}(5/12)$$

$$= 22.6^\circ$$

$$F = 100N \quad [4.4]$$

$$r = 10cm = 0.1m$$

$$\tau = rF$$

$$= 0.1 \times 100$$

$$= 10Nm$$

$$F_x = 20N \quad [4.5]$$

$$\theta = 30^\circ$$

$$F_x = F \cos \theta$$

$$F = F_x / \cos \theta$$

$$= 20 / \cos 30^\circ$$

$$= 20 / 0.866$$

$$= 23.1N$$

$$F = 50N \quad [4.6]$$

$$r = 16cm = 0.16m$$

کیل کھارک

$$F = 2rF$$

$$= 2 \times 0.16 \times 50$$

$$= 16Nm$$

$$T_1 = 3.8N \quad [4.7]$$

$$T_2 = 4.4N$$

$$W = T_1 + T_2$$

$$= 3.8 + 4.4$$

$$= 8.2N$$

$$m_1 = 3kg \quad [4.8]$$

$$m_2 = 5kg$$

$$T_1 = mg$$

$$= 3 \times 10$$

$$= 30N$$

$$T_2 = (m_1 + m_2)g$$

$$= (3 + 5) \times 10$$

$$= 80N$$

$$F_1 = 200N \quad [4.9]$$

$$r_1 = 20cm = 0.2m$$

$$F_2 = 150N$$

$$r_2 = ?$$

$$\tau_1 = \tau_2$$

$$F_1r_1 = F_2r_2$$

$$r_2 = F_1r_1/F_2$$

$$= 0.1 \times 200 / 150$$

$$= 0.133m$$

$$= 13.3cm$$

$$m = 10kg \quad [4.10]$$

$$F_1 = mg$$

$$F_1 = 10 \times 10 = 100N$$

$$r_1 = 20cm = 0.2m$$

$$r_2 = 50cm = 0.5m$$

$$F_2 = ?$$

اٹنی کھارک وائر = کھارک وائر کھارک

$$F_2r_2 = F_1r_1$$

$$F_2 = F_1r_1/r_2$$

$$= 100 \times 0.2 / 0.5$$

$$= 20 / 0.5$$

$$= 40N$$

## CHAPTER # 05

Exp: 1, 2

$$m_1 = 1000kg \quad [5.1]$$

$$m_2 = 1000kg$$

$$d = 0.5m$$

$$G = 6.67 \times 10^{-11} Nm^2kg^{-2}$$

$$F = Gm_1m_2/d^2$$

$$= G \times 10^3 \times 10^3 / (0.5)^2$$

$$= 6.67 \times 10^{-11} \times 10^6 / 0.25$$

$$= 26.7 \times 10^{-11+6}$$

$$= 26.7 \times 10^{-5}$$

$$= 2.67 \times 10^{-4} N$$

$$m = m_1 = m_2 = ? \quad [5.2]$$

$$F = 0.006673N$$

$$d = 1m$$

$$G = 6.67 \times 10^{-11} Nm^2kg^{-2}$$

$$F = Gm_1m_2/d^2$$

$$m^2 = Fd^2/G$$

$$= \frac{0.006673(1)^2}{6.673 \times 10^{-11}}$$

$$= \frac{6.673 \times 10^{-3}}{6.673 \times 10^{-11}}$$

$$m^2 = 1 \times 10^{-3+11}$$

$$= 10^8$$

$$\sqrt{m^2} = \sqrt{(10^8)^2}$$

$$m = 10000kg$$

$$M_m = 6.42 \times 10^{23}kg$$

$$R_m = 3370km \quad [5.3]$$

$$= 3.370 \times 10^6m$$

$$G = 6.67 \times 10^{-11} Nm^2kg^{-2}$$

$$g_m = GM_m/R^2$$

$$= \frac{6.673 \times 10^{-11} \times 6.42 \times 10^{23}}{(3.370 \times 10^6)^2}$$

$$= \frac{42.84 \times 10^{23-11}}{11.35 \times 10^{12}}$$

$$= 3.77 \times 10^{12-12}$$

$$= 3.77 \times 10^0$$

$$g_m = 3.77m/s^2$$

$$g_m = 1.62m/s^2 \quad [5.4]$$

$$R_m = 1740km$$



$$\begin{aligned}
 &= 1.740 \times 10^6 \text{m} \\
 G &= 6.67 \times 10^{-11} \text{Nm}^2\text{kg}^{-2} \\
 M_m &= g_m R^2 / G \\
 &= \frac{1.62 \times (1.74 \times 10^6)^2}{6.67 \times 10^{-11}} \\
 &= \frac{1.62 \times 3.027 \times 10^{12}}{6.67 \times 10^{-11}} \\
 &= 4.904712 \times 10^{12+11} \\
 &= 4.904712 \times 10^{23} \\
 M_m &= 7.35 \times 10^{22} \text{kg} \\
 h &= 3600 \text{km} \quad [5.5] \\
 &= 3.6 \times 10^6 \text{m} \\
 R &= 6.4 \times 10^6 \text{m} \\
 M_e &= 6 \times 10^{24} \text{kg} \\
 g_m &= GM / (R+h)^2 \\
 &= \frac{6.67 \times 10^{-11} \times 6 \times 10^{24}}{(6.4 \times 10^6 + 3.6 \times 10^6)^2} \\
 &= \frac{40.038 \times 10^{13}}{[(6.4+3.6) \times 10^6]^2} \\
 &= \frac{40.038 \times 10^{13}}{(10 \times 10^6)^2} \\
 &= \frac{40.038 \times 10^{13}}{100 \times 10^{12}} \\
 &= 0.4 \times 10^{13-12} \\
 &= 0.4 \times 10^1 \\
 g_m &= 4 \text{m/s}^2 \\
 R &= 48700 \text{km} \quad [5.6] \\
 &= 48.7 \times 10^6 \text{m} \\
 g &= GM / R^2 \\
 &= \frac{6.67 \times 10^{-11} \times 6 \times 10^{24}}{(48.7 \times 10^6)^2} \\
 &= \frac{40.038 \times 10^{13}}{2371.69 \times 10^{12}} \\
 &= 0.017 \times 10^{13-12} \\
 &= 0.017 \times 10^1 \\
 g &= 0.17 \text{m/s}^2 \\
 R &= 10000 \text{km} \quad [5.7] \\
 &= 10^7 \text{m} \\
 g &= 4 \text{m/s}^2 \\
 M_e &= g R^2 / G \\
 &= \frac{4 \times (10^7)^2}{6.67 \times 10^{-11}} \\
 &= 0.599 \times 10^{14+11} \\
 &= 0.599 \times 10^{25} \\
 M &= 5.99 \times 10^{24} \text{kg} \\
 g_h &= \frac{1}{4} g \quad [5.8] \\
 g_h &= GM / (R+h)^2 \\
 (R+h)^2 &= GM / g_h \\
 &= GM / \frac{1}{4} g \\
 (R+h)^2 &= 4GM / g \\
 &\text{دونوں طرف جذری} \\
 \sqrt{(R+h)^2} &= \sqrt{4GM / g} \\
 R+h &= \sqrt{4R^2} \\
 R+h &= 2R
 \end{aligned}$$



$$\begin{aligned}
 h &= 2R - R \\
 h &= R \\
 h &= 850 \text{km} \quad [5.9] \\
 h &= 0.85 \times 10^6 \text{m} \\
 V_0 &= (GM / (R+h))^{1/2} \\
 &= \left( \frac{6.67 \times 10^{-11} \times 6 \times 10^{24}}{(0.85 \times 10^6 + 6.4 \times 10^6)^2} \right)^{1/2} \\
 &= \left( \frac{40.038 \times 10^{13}}{[(0.85+6.4) \times 10^6]^2} \right)^{1/2} \\
 &= \left( \frac{40.038 \times 10^{13}}{(7.25 \times 10^6)^2} \right)^{1/2} \\
 &= (5.522 \times 10^7)^{1/2} \\
 &= (55.22 \times 10^6)^{1/2} \\
 &= 7.431 \times 10^3 \\
 V_0 &= 7431 \text{m/s} \\
 h &= 42000 \text{km} \quad [5.10] \\
 &= 42 \times 10^6 \text{m} \\
 V_0 &= (GM / (R+h))^{1/2} \\
 &= \left( \frac{6.67 \times 10^{-11} \times 6 \times 10^{24}}{(42 \times 10^6 + 6.4 \times 10^6)^2} \right)^{1/2} \\
 &= \left( \frac{40.038 \times 10^{13}}{[(42+6.4) \times 10^6]^2} \right)^{1/2} \\
 &= \left( \frac{40.038 \times 10^{13}}{(48.4 \times 10^6)^2} \right)^{1/2} \\
 &= (0.8272 \times 10^7)^{1/2} \\
 &= (8.272 \times 10^6)^{1/2} \\
 &= 2.876 \times 10^3 \\
 V_0 &= 2876 \text{m/s} \\
 \text{CHAPTER \# 06} \\
 \text{Exp: 1, 2, 3, 4, 5} \\
 F &= 300 \text{N} \quad [6.1] \\
 d &= 35 \text{m} \\
 W &= Fd \\
 &= 300 \times 35 \\
 &= 10500 \text{J} \\
 W &= mg = 20 \text{N} \quad [6.2] \\
 h &= 6 \text{m} \\
 P.E &= mgh \\
 &= 20 \times 6 \\
 &= 120 \text{J} \\
 W &= 12 \text{kN} \quad [6.3] \\
 &= 12000 \text{N} \\
 V &= 20 \text{m/s} \\
 W &= mg \\
 m &= W / g \\
 &= 12000 / 10 \\
 &= 1200 \text{kg} \\
 K.E &= \frac{1}{2} m V^2 \\
 &= \frac{1}{2} \times 1200 \times (20)^2 \\
 &= 600 \times 400 \\
 &= 240000 \\
 &= 240 \times 10^3 \\
 &= 240 \text{kJ} \\
 m &= 500 \text{g} \quad [6.4] \\
 &= 0.5 \text{kg}
 \end{aligned}$$

$$\begin{aligned}
 V &= 15 \text{m/s} \\
 K.E &= \frac{1}{2} m V^2 \\
 &= \frac{1}{2} \times 500 \times (0.5)^2 \\
 &= 0.5 \times 225 / 2 \\
 K.E &= 56.25 \text{J} \\
 &\text{کنٹرولیشن آف انرجی کے قانون کے مطابق} \\
 K.E &= P.E \\
 P.E &= 56.25 \text{J} \\
 h &= 6 \text{m} \quad [6.5] \\
 V &= 1.5 \text{m/s} \\
 m &= 40 \text{kg} \\
 P.E &= mgh \\
 &= 40 \times 10 \times 6 \\
 &= 2400 \text{J} \\
 K.E &= \frac{1}{2} m V^2 \\
 &= \frac{1}{2} \times 40 \times (1.5)^2 \\
 &= 20 \times 2.25 \\
 &= 45 \text{J} \\
 V &= 4 \text{m/s} \quad [6.6] \\
 F &= 4000 \text{N} \\
 P &= W / t = F.d / t \\
 P &= F.V \\
 &= 4000 \times 4 \\
 &= 16000 \text{W} \\
 &= 16 \text{kW} \\
 F &= 300 \text{N} \quad [6.7] \\
 d &= 50 \text{m} \\
 t &= 60 \text{s} \\
 P &= W / t = F.d / t \\
 P &= 300 \times 50 / 60 \\
 &= 250 \text{W} \\
 m &= 50 \text{kg} \quad [6.8] \\
 t &= 20 \text{s} \\
 \text{سیڑ کی لمبائی} &= 16 \text{cm} \\
 &= 16 \times 100 = 0.16 \text{m} \\
 \text{سیڑ کی تھیلوں کی تعداد} &= 25 \\
 h &= 25 \times 0.16 = 4 \text{m} \\
 P &= W / t = mgh / t \\
 &= 50 \times 10 \times 4 / 20 \\
 &= 100 \text{W} \\
 m &= 200 \text{kg} \quad [6.9] \\
 h &= 6 \text{m} \\
 t &= 10 \text{s} \\
 P &= W / t = mgh / t \\
 &= 200 \times 10 \times 6 / 10 \\
 &= 1200 \text{W} \\
 m &= 800 \text{kg} \quad [6.10] \\
 P &= 1 \text{hp} = 746 \text{W} \\
 t &= 10 \text{mint} = 600 \text{s} \\
 h &= 15 \text{m} \\
 P &= W / t \\
 W &= P \times t \\
 &= 746 \times 600
 \end{aligned}$$

$$\begin{aligned}
 \text{input} &= 447600 \text{J} \\
 W &= mgh \\
 &= 800 \times 10 \times 15 \\
 \text{output} &= 120000 \text{J} \\
 E_f &= (\text{output} / \text{input}) \times 100 \\
 &= \frac{120000}{447600} \times 100 \\
 E_f &= 26.8\% \\
 \text{CHAPTER \# 07} \\
 \text{Exp: 1, 2} \\
 m &= 850 \text{g} \quad [7.1] \\
 &= 850 / 1000 = 0.85 \text{kg} \\
 V &= 40 \text{cm} \times 10 \text{cm} \times 5 \text{cm} \\
 &= \frac{40 \text{m}}{100} \times \frac{10 \text{m}}{100} \times \frac{5 \text{m}}{100} \\
 &= 0.4 \text{m} \times 0.1 \text{m} \times 0.05 \text{m} \\
 V &= 0.002 \text{m}^3 \\
 \rho &= m / V \\
 &= 0.85 / 0.002 \\
 &= 425 \text{kg/m}^3 \\
 m &= 1 \text{L} = 1 \text{kg} \quad [7.2] \\
 \rho &= 0.92 \text{kg/L} \\
 V &= m / \rho \\
 &= 1 / 0.92 = 1.09 \text{L} \\
 \text{(a) } m &= 5 \text{kg} \quad [7.3] \\
 \rho &= 8200 \text{kg/m}^3 \\
 V &= m / \rho = 5 / 8200 \\
 &= 6.01 \times 10^{-4} \text{m}^3 \\
 \text{(b) } m &= 200 \text{g} \\
 &= 200 / 1000 = 0.2 \text{kg} \\
 \rho &= 11300 \text{kg/m}^3 \\
 V &= m / \rho = 0.2 / 11300 \\
 &= 1.77 \times 10^{-5} \text{m}^3 \\
 \text{(c) } m &= 0.2 \text{kg} \\
 \rho &= 19300 \text{kg/m}^3 \\
 V &= m / \rho = 0.2 / 19300 \\
 &= 1.04 \times 10^{-5} \text{m}^3 \\
 \rho &= 1.3 \text{kg/m}^3 \quad [7.4] \\
 V &= 8 \text{m} \times 5 \text{m} \times 4 \text{m} \\
 &= 160 \text{m}^3 \\
 m &= \rho \times V \\
 &= 160 \times 1.3 \\
 &= 208 \text{kg} \\
 F &= 75 \text{N} \quad [7.5] \\
 A &= 1.5 \text{cm}^2 \\
 (1 \text{m})^2 &= (100 \text{cm})^2 \\
 1 / 10^4 \text{m}^2 &= 1 \text{cm}^2 \\
 1.5 \text{cm}^2 &= 0.00015 \text{m}^2 \\
 P &= F / A \\
 &= 75 / 0.00015 \\
 &= 5 \times 10^5 \text{Pa} \\
 L &= 10 \text{mm} \quad [7.6] \\
 &= 10 / 1000 = 0.01 \text{m} \\
 A &= L \times L = 0.01 \times 0.01 \\
 &= 1 \times 10^{-4} \text{m}^2
 \end{aligned}$$



$$F = 20N$$

$$P = F/A = 20/10^{-4}$$

$$= 2 \times 10^5 N/m^2$$


---


$$m = 1000g = 1kg \quad [7.7]$$

$$A = 7.5cm \times 7.5cm$$

$$= \frac{7.5m}{100} \times \frac{7.5m}{100}$$

$$= 0.075m \times 0.075m$$

$$A = 0.005625m^2$$

$$F = mg$$

$$= 1 \times 10 = 10N$$

$$P = F/A$$

$$= 10/0.005625$$

$$= 1778N/m^2$$

$$V = \frac{20cm}{100} \times \frac{7.5cm}{100} \times \frac{7.5cm}{100}$$

$$= 0.2m \times 0.075m \times 0.075m$$

$$V = 0.001125m^3$$

$$\rho = m/V$$

$$= 1/0.001125$$

$$= 888.89kg/m^3$$

کیوب کے ماس اور ڈینسٹی کے لحاظ سے

اس کا اصل والیوم 7.8

$$m = 306g$$

$$\rho = 2.55g/cm^3$$

$$V_0 = m/\rho$$

$$= 306/2.55$$

$$= 120cm^3$$

کیوب کی شکل کی وجہ سے اس کا والیوم

$$V_s = 5 \times 5 \times 5 = 125cm^3$$

$$V_c = V_s - V_0$$

$$V_c = 125 - 120 = 5cm^3$$

$$W_{air} = 18N \quad [7.9]$$

$$W_{water} = 11.4N$$

$$D = (W_{air}/W_{air} - W_{wat})\rho$$

$$D = (18/6.6) \times 1000$$

$$= 2727kg/m^3 \quad (AI)$$

$$W = 3.06N \quad [7.10]$$

$$m = W/g = 3.06/10$$

$$= 0.306kg = 306g$$

$$\rho = 0.6g/cm^3$$

(a)  $V = m/\rho$

$$= 306/0.6 = 510cm^3$$

(b)  $V = m/\rho$

$$= 306/0.9 = 340cm^3$$

$$F_2 = 20000N \quad [7.11]$$

پریس کے پلسٹن کا ایریا

$$D = 30cm$$

$$R = D/2 = 30/2$$

$$= 15cm = 0.15m$$

$$A = \pi R^2$$

$$= 3.14 \times (0.15)^2$$

$$= 0.07065m^2$$

پمپ کے پلسٹن کا ایریا

$$d = 3cm$$

$$r = d/2 = 3/2$$

$$= 1.5cm = 0.015m$$

$$a = \pi r^2$$

$$= 3.14 \times (0.015)^2$$

$$= 0.0007065m^2$$

$$F_2/A = F_1/a$$

$$F_1 = F_2 a/A$$

$$= 20000 \times 0.0007065$$

$$0.07065$$

$$F_1 = 14.13/0.07065$$

$$F_1 = 200N$$

$$A = 2 \times 10^{-5}m^2 \quad [7.12]$$

$$F = 4000N$$

$$\Delta L = 2mm$$

$$= 2/1000 = 0.002m$$

$$Y = FL/A\Delta L$$

$$= 4000 \times 2 / (2 \times 10^{-5} \times 0.002)$$

$$= 8000 / 4 \times 10^{-8}$$

$$Y = 2 \times 10^{11} N/m^2$$

## CHAPTER # 08

Exp: 1, 2, 3, 4

$$C = 50^\circ C \quad [8.1]$$

$$F = 1.8^\circ C + 32$$

$$= 1.8 \times 50 + 32$$

$$F = 122^\circ F$$

$$F = 98.6^\circ F \quad [8.2]$$

$$C = (F - 32)/1.8$$

$$= (98.6 - 32)/1.8$$

$$= 37^\circ C$$

$$K = C + 273$$

$$= 37 + 273$$

$$= 310K$$

$$L_0 = 2m \quad [8.3]$$

$$T_1 = 0^\circ C = 273K$$

$$T_2 = 20^\circ C = 293K$$

$$\alpha = 2.5 \times 10^{-5} K^{-1}$$

$$\Delta L = \alpha L_0 (T_2 - T_1)$$

$$= 2.5 \times 10^{-5} \times 2 \times (293 - 273)$$

$$= 2.5 \times 10^{-5} \times 2 \times (20)$$

$$= 2.5 \times 40 \times 10^{-5}$$

$$= 100/10^5$$

$$= 0.001m = 0.1cm$$

$$V_0 = 1.2m^3 \quad [8.4]$$

$$T_1 = 15^\circ C = 288K$$

$$T_2 = 40^\circ C = 313K$$

$$\beta = 3.67 \times 10^{-3} K^{-1}$$

$$V = V_0 (1 + \beta \Delta T)$$

$$= 1.2 [1 + 3.67 \times 10^{-3} (313 - 288)]$$

$$= 1.2 [1 + 3.67 \times 10^{-3} (25)]$$

$$= 1.2 [1 + 0.09175]$$

$$V = 1.3m^3$$

$$m = 0.5kg \quad [8.5]$$

$$T_1 = 10^\circ C = 283K$$

$$T_2 = 65^\circ C = 338K$$

$$C = 4200J/kgK$$

$$\Delta Q = Cm\Delta T$$

$$= 0.5 \times 4200 (338 - 283)$$

$$= 05 \times 4200 \times 55$$

$$\Delta Q = 115500J$$

$$\Delta Q = 1000J/s \quad [8.6]$$

$$m = 200g = 0.2kg$$

$$T_1 = 20^\circ C = 293K$$

$$T_2 = 90^\circ C = 363K$$

$$Q = Cm\Delta T/t$$

$$t = 4200 \times 0.2 (363 - 293) / Q$$

$$t = 840 (70) / 1000$$

$$t = 58800 / 1000$$

$$t = 58.8s$$

$$\Delta Q = 50000J \quad [8.7]$$

$$H_f = 336000K/kg$$

$$\Delta Q = H_f m$$

$$m = \Delta Q / H_f$$

$$m = 50000 / 336000$$

$$= 0.149kg$$

$$= 150g$$

$$m = 100g = 0.1kg \quad [8.8]$$

$$Q_1 = Cm\Delta T (-10 \rightarrow 0)$$

$$= 2100 \times 0.1 [0 - (-10)]$$

$$Q_1 = 2100J$$

$$Q_2 = mH_f \quad (@ 0^\circ C)$$

$$= 0.1 \times 336000$$

$$Q_2 = 33600J$$

$$Q_3 = Cm\Delta T (0 \rightarrow 10)$$

$$= 4200 \times 0.1 (10 - 0)$$

$$Q_3 = 4200J$$

$$Q = Q_1 + Q_2 + Q_3$$

$$= 2100 + 33600 + 4200$$

$$Q = 39900J$$

$$T = 100^\circ C \quad [8.9]$$

$$m = 100g = 0.1kg$$

$$H_v = 2.26 \times 10^6 J/kg$$

$$\Delta Q = mH_v$$

$$= 0.1 \times 2.26 \times 10^6$$

$$= 2.26 \times 10^5 J$$

$$m_{steam} = 5g \quad [8.10]$$

$$= 5/1000 = 0.005kg$$

$$m_{water} = 500g$$

$$= 500/1000 = 0.5kg$$

$$Q = m_{water} H_v + m_{steam} H_f$$

$$= 0.5 \times 2.26 \times 10^6 + 0.005 \times 336000$$

$$= 1130000 + 1680$$

$$Q = 1131680J$$

$$Q = 1131680J$$

$$Q_p = Cm\Delta T$$

$$= Cm(T_2 - T_1)$$

$$= 2100 \times 0.5 (T_2 - 10)$$

$$= 2100T_2 - 21000$$

ماس کے لحاظ سے بھاپ کی خارج کردہ حرارت

$$Q = mH_v$$

$$= 0.005 \times 2.26 \times 10^6$$

$$= 11300J$$

بھاپ کی پہلے ٹیمپریچر سے آخری ٹیمپریچر تک جاتے ہوئے خارج کردہ حرارت

$$Q = Cm\Delta T$$

$$= 4200 \times 0.005 (100 - T_2)$$

$$= Q = 2100 - 21T_2$$

پانی کی جذب کردہ حرارت = بھاپ کی خارج کردہ حرارت

$$2100T_2 - 2100 = 11300 + 2100 - 21T_2$$

$$2100T_2 + 21T_2 = 11300 + 2100 + 21000$$

$$2121T_2 = 34400$$

$$T_2 = 34400/2121$$

$$T_2 = 16.21^\circ C$$

## CHAPTER # 09

$$A = 200m^2 \quad [9.1]$$

$$L = 20cm = 0.2m$$

$$T_1 = 15^\circ C = 288K$$

$$T_2 = 35^\circ C = 308K$$

$$k = 0.65 W/mK$$

$$Q/t = kA(T_2 - T_1)/L$$

$$= 0.65 \times 200 (308 - 288) / 0.2$$

$$= 130 \times (20) / 0.2$$

$$= 13000J/s$$

$$A = 2 \times 2.5 = 5m^2 \quad [9.2]$$

$$L = 0.8cm = 0.008m$$

$$t = 1hr = 3600s$$

$$T_1 = 5^\circ C = 278K$$

$$T_2 = 25^\circ C = 298K$$

$$k = 0.8 W/mK$$

$$Q = kA(T_2 - T_1)xt/L$$

$$= 0.8 \times 5 (298 - 278) \times 3600 / 0.008$$

$$= 4(20)3600 / 0.008$$

$$= 288000 / 0.008$$

$$= 36000000$$

$$Q = 3.6 \times 10^7 J$$

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## NUMERICAL-10

### CHAPTER # 10

Exp: 1, 2, 3

$T = 2s$  10.1

$g_e = 10m/s$

$g_m = g_e/6$

$= 10/6$

$= 1.67m/s$

$L = ?$

$T = 2\pi\sqrt{l/g}$

$T^2 = [2\pi\sqrt{l/g}]^2$

$T^2 = 4\pi^2 \times L/g$

$L = T^2 \times g / 4\pi^2$

زمین کے لیے لمبائی

$L = (2)^2 \times 10 / 4 \times (3.14)^2$

$= 10 / 9.8596$

$= 1.02m$

چاند کے لیے لمبائی

$L = (2)^2 \times 1.67 / 4 \times (3.14)^2$

$= 1.67 / 9.8596$

$= 0.17m$

$L = 0.99m$  10.2

$T = 4.9s$

$T = 2\pi\sqrt{l/g}$

$T^2 = [2\pi\sqrt{l/g}]^2$

$T^2 = 4\pi^2 \times L/g$

$g = 4\pi^2 \times L / T^2$

$= 4 \times (3.14)^2 \times 0.99 / (4.9)^2$

$= 4 \times (9.8596) \times (0.99) / 24.01$

$g = 1.63m/s^2$

$L = 1m$  10.3

$g_e = 10m/s$

$g_m = 1.67m/s$

$T = 2\pi\sqrt{l/g}$

زمین کی سطح پر ٹائم پیریڈ

$T = 2 \times (3.14) \times \sqrt{1/10}$

$= 6.28 \times \sqrt{0.1} = 2s$

چاند کی سطح پر ٹائم پیریڈ

$T = 2 \times (3.14) \times \sqrt{1/1.6}$

$= 6.28 \times \sqrt{0.598}$

$= 4.9s$

$T = 2s$  10.4

$g = 10m/s^2$

$T = 2\pi\sqrt{l/g}$

$T^2 = [2\pi\sqrt{l/g}]^2$

$T^2 = 4\pi^2 \times L/g$

$L = T^2 \times g / 4\pi^2$

$= (2)^2 \times 10 / 4 \times (3.14)^2$

$= 4 \times 10 / 4 \times 9.85$

$= 40 / 39.4$

$L = 1.02m$

$t = 20s$  10.5

ویوز کی تعداد  $= n = 100$

$\lambda = 6cm$

$= 6/100$

$= 0.06m$

$f =$  وقت / ویوز کی تعداد

$= n/t$

$= 100/20$

$= 5Hz$

$T = 1/f$

$= 1/5$

$= 0.2s$

$V = f\lambda$

$= 5 \times 0.06 = 0.3m/s$

$f = 12Hz$  10.6

$\lambda = 3cm$

$= 3/100$

$= 0.03m$

$V = f\lambda$

$= 12 \times 0.03$

$= 0.36m/s$

$f = 190Hz$  10.7

$S = 90m$

$t = 0.5s$

(a) ٹائم پیریڈ

$T = 1/f$

$T = 1/190$

$= 0.005s$

(b) سپیڈ

$V = S/t$

$V = 90/0.5$

$= 180m/s$

(c) ویو لینتھ

$V = f\lambda$

$\lambda = V/f$

$\lambda = 180/190$

$= 0.95m$

$f = 4.8Hz$  10.8

$\lambda = 6cm$

$= 0.06m$

(a) سپیڈ

$V = f\lambda$

$V = 4.8 \times 0.06$

$= 0.29m/s$

(b) ٹائم پیریڈ

$T = 1/f$

$T = 1/4.8$

$= 0.21s$

$f = 5Hz$  10.9

$\lambda = 40mm$

$= 40 \times 10^{-3}m$

$S = 80cm$

$= 80/100$

$= 0.8m$

$V = f\lambda$

$= 5 \times 40 \times 10^{-3}$

$= 0.2m/s$

$S = Vt$

$t = S/V$

$= 0.8/0.2$

$= 4s$

$f = 90MHz$  10.10

$= 90 \times 10^6 Hz$

$V = 3 \times 10^8 m/s$

$V = f\lambda$

$\lambda = V/f$

$= 3 \times 10^8 / 90 \times 10^6$

$= 3.33m$

### CHAPTER # 11

Exp: 2, 3

$I = 3 \times 10^{-6} W/m^2$  11.1

$I_0 = 10^{-12} W/m^2$

(a) ساؤنڈ لیول

$S.L = 10 \log I / I_0 (dB)$

$= 10 \log (3 \times 10^{-6} / 10^{-12})$

$= 10 \log (3 \times 10^6)$

$= 10 [\log 3 + \log 10^6]$

$= 10 [\log 3 + 6 \log 10]$

$= 10 [0.4771 + 6(1)]$

$= 64.771$

$= 64.8dB$

(b) انٹینسٹی

$S.L = 100dB$

$S.L = 10 \log I / I_0 (dB)$

$100 = 10 \log I / 10^{-12}$

$10 = \log I / 10^{-12}$

$10^{10} = I / 10^{-12}$

$10^{10} \times 10^{-12} = I$

$10^{-2} = I$

$I = 0.01 W/m^2$

$I = 0.01 W/m^2$

$I = 0.01 W/m^2$

$S.L = 80dB$  11.2

$I_0 = 10^{-12} W/m^2$

$S.L = 10 \log I / I_0 (dB)$

$80 = 10 \log I / 10^{-12}$

$8 = \log I / 10^{-12}$

$10^8 = I / 10^{-12}$

$10^8 \times 10^{-12} = I$

$I = 10^{-4} W/m^2$

$V = 330m/s$  11.3

$\lambda = 5cm$

$= 5/100$

$= 0.05m$

$V = f\lambda$

$330 = f \times 0.05$

$f = 330/0.05$

$= 6.6 \times 10^3 Hz$

ساؤنڈ قابل سماعت ہے

ویوز کی تعداد  $= n = 72$  11.4

تعداد

$t = 60s$

(a) فریکوئنسی

$f =$  وقت / ویوز کی تعداد

$f = n/t$

$= 72/60$

$= 1.2Hz$

(b) ٹائم پیریڈ

$T = 1/f$

$= 1/1.2$

$= 0.83s$

$T = 1.5s$  11.5

$t = 1.5/2$

$= 0.75s$

$V = 1500m/s$

$S = Vt$

$= 1500 \times 0.75$

$= 1125m$

ٹائم صرف ایک طرف کا لیا جائے گا

$T = 5s$  11.6

$t = 5/2$

$= 2.5s$

$V = 346m/s$

$S = Vt$

$= 346 \times 2.5$

$= 865m$

ٹائم صرف ایک طرف کا لیا جائے گا

$T = 3.42s$  11.7

$t = 3.42/2$

$= 1.71s$

$V = 1531m/s$

$S = Vt$

$= 1531 \times 1.71$

$= 2618m$

ٹائم صرف ایک طرف کا لیا جائے گا

$V = 343m/s$  11.8

$f = 20000Hz$

(a) بلند ترین فریکوئنسی کے لیے

$V = f\lambda$

$343 = 20000 \times \lambda$



$$\lambda = 343/20000$$

$$\lambda = 1.7 \times 10^{-2} \text{m}$$

(b) کم ترین فریکوئنسی کے لیے

$$V = f\lambda$$

$$343 = 20 \times \lambda$$

$$\lambda = 343/20 = 17.2 \text{m}$$

$$f = 2 \text{kHz} \quad \boxed{11.9}$$

$$= 2000 \text{Hz}$$

$$\lambda = 35 \text{cm}$$

$$= 35/100$$

$$= 0.35 \text{m}$$

$$S = 1.5 \text{km}$$

$$= 1.5 \times 1000$$

$$= 1500 \text{m}$$

$$V = f\lambda$$

$$= 2000 \times 0.35$$

$$= 700 \text{m/s}$$

$$S = Vt$$

$$t = S/V$$

$$= 1500/700$$

$$= 2.1 \text{s}$$

## CHAPTER # 12

Exp: 1, 2, 3, 4

$$p = 10 \text{cm} \quad \boxed{12.1}$$

$$q = -5 \text{cm}$$

ایک مرر کے پیچھے، اس لیے نفی آیا

$$1/f = 1/p + 1/q$$

$$= 1/10 + 1/(-5)$$

$$f = -10 \text{cm}$$

(diverging-mirror)

$$HO = 30 \text{cm} \quad \boxed{12.2}$$

$$p = 10.5 \text{cm}$$

$$f = 16 \text{cm}$$

$$1/f = 1/p + 1/q$$

$$1/16 = 1/10.5 + 1/q$$

$$1/q = 1/16 - 1/10.5$$

$$= (10.5 - 16)/16 \times 10.5$$

$$1/q = -168/5.5$$

$$q = 30.54 \text{cm}$$

(converging-mirror)

HI: ایچ کی اونچائی

HO: جسم کی اونچائی

$$HI/HO = q/p$$

$$HI/30 = 30.54/10.5$$

$$HI = 87.26 \text{cm}$$

$$p = 20 \text{cm} \quad \boxed{12.3}$$

$$HI/HO = q/p$$

$$HI/HI = q/p$$

$$1 = q/p$$

$$q = p = 20 \text{cm}$$

$$1/f = 1/p + 1/q$$

$$= 1/20 + 1/20$$

$$f = 10 \text{cm}$$

$$p = 34.4 \text{cm} \quad \boxed{12.4}$$

$$q = -5.66 \text{cm}$$

(diverging-mirror)

$$1/f = 1/p + 1/q$$

$$= 1/34.4 + 1/(-5.66)$$

$$= (5.66 - 34.4)/34.4 \times 5.66$$

$$f = -194.7/28.74$$

$$= -6.77 \text{cm}$$

$$f = -13.5 \text{cm} \quad \boxed{12.5}$$

$$q = -11.5 \text{cm}$$

$$1/f = 1/p + 1/q$$

$$1/(-13.5) = 1/p + 1/(-11.5)$$

$$1/p = 1/11.5 - 1/13.5$$

$$= (13.5 - 11.5)/11.5 \times 13.5$$

$$p = 155.25/2$$

$$= 77.62 \text{cm}$$

$$f = -8.70 \text{cm} \quad \boxed{12.6}$$

$$HO = 13.2 \text{cm}$$

$$p = 19.3 \text{cm}$$

$$p = 2p = 2(19.3)$$

$$= 38.4 \text{cm}$$

$$1/f = 1/p + 1/q$$

$$1/(-8.70) = 1/19.3 + 1/q$$

$$1/q = 1/8.70 + 1/19.3$$

$$= (19.3 - 8.70)/8.70 \times 19.3$$

$$q = 167.91/10.6$$

$$= 15.84$$

(b) ایچ کی اونچائی

$$HI/HO = q/p$$

$$I/13.2 = 16.84/19.3$$

$$HI = 10.8 \text{cm}$$

(c) ایچ کی اونچائی

$$HI/HO = q/p$$

$$I/13.2 = 15.84/38.4$$

$$HI = 5.42 \text{cm}$$

$$R = 38 \text{cm} \quad \boxed{12.7}$$

$$f = R/2$$

$$= 38/2$$

$$= 19 \text{cm}$$

$$p = 50 \text{cm}$$

$$1/f = 1/p + 1/q$$

$$1/19 = 1/50 + 1/q$$

$$1/q = 1/19 - 1/50$$

$$= (50 - 19)/19 \times 50$$

$$q = 950/31$$

$$= 30.64 \text{cm}$$

ایچ سیدھی ہوگی

$$HO = 4 \text{cm} \quad \boxed{12.8}$$

$$p = 12 \text{cm}$$

$$f = 8 \text{cm}$$

$$1/f = 1/p + 1/q$$

$$1/8 = 1/12 + 1/q$$

$$1/q = (6-4)/48$$

$$q = 24 \text{cm}$$

(b) ایچ کی اونچائی

$$HI/HO = q/p$$

$$HI/4 = 24/12$$

$$HI = 8 \text{cm}$$

ایچ، ریل، الٹی، بڑی

$$O = 10 \text{cm} \quad \boxed{12.9}$$

$$p = 20 \text{cm}$$

$$f = -15 \text{cm}$$

$$1/f = 1/p + 1/q$$

$$1/(-15) = 1/20 + 1/q$$

$$1/q = (-4-3)/60$$

$$q = -8.75 \text{cm}$$

$$HI/HO = q/p$$

$$HI/10 = 8.75/20$$

$$HI = 4.28 \text{cm}$$

ایچ، درچوکل، سیدھی، بڑی

$$f = 6 \text{cm} \quad \boxed{12.10}$$

$$q/p = 3/1$$

$$q = 3p = -3p$$

$$1/f = 1/p + 1/q$$

$$1/6 = 1/p + 1/(-3p)$$

$$p = 4 \text{cm}$$

$$i = 35^\circ \quad \boxed{12.11}$$

$$n = 1.25$$

(a) اینگیل آف رفریکشن

$$n = \sin i / \sin r$$

$$1.25 = \sin 35^\circ / \sin r$$

$$\sin r = 0.57/1.25$$

$$\sin r = 0.45$$

$$r = \sin^{-1}(0.45)$$

$$r = 27.32^\circ$$

(b) کریٹیکل اینگیل کے لیے

$$n = \sin r / \sin i$$

$$1.25 = \sin 90^\circ / \sin C$$

$$\sin C = 1/1.25$$

$$\sin C = 0.80$$

$$C = \sin^{-1}(0.80)$$

$$= 53.13^\circ$$

$$P = 5 \text{D} \quad \boxed{12.12}$$

$$f = 1/P$$

$$= 1/5$$

$$= 0.2 \text{m}$$

میٹر کو سینٹی میٹر بنایا

$$f = 20 \text{cm}$$

$$q/p = 2/1$$

$$q = 2p$$

$$1/f = 1/p + 1/q$$

$$1/20 = 1/p + 1/2p$$

$$p = 30 \text{cm}$$

## CHAPTER # 13

Exp: 1, 2

$$Q = 100 \mu\text{C} \quad \boxed{13.1}$$

$$= 100 \times 10^{-6} \text{C}$$

$$= 10^{-4} \text{C}$$

$$e^- = 1.6 \times 10^{-19} \text{C}$$

$$Q = ne$$

$$n = Q/e$$

$$= 10^{-4}/1.6 \times 10^{-19}$$

$$= 0.625 \times 10^{-4+19}$$

$$n = 6.25 \times 10^{14}$$

$$q_1 = 10 \mu\text{C} \quad \boxed{13.2}$$

$$= 10 \times 10^{-6} \text{C}$$

$$= 10^{-5} \text{C}$$

$$q_2 = 5 \mu\text{C}$$

$$= 5 \times 10^{-6} \text{C}$$

$$r = 150 \text{cm}$$

$$= 150/100$$

$$= 1.5 \text{m}$$

$$k = 9 \times 10^9 \text{Nm}^2/\text{C}^2$$

$$F = kq_1q_2/r^2$$

$$= 9 \times 10^9 \times 10^{-5} \times 5 \times 10^{-6}$$

$$(1.5)^2$$

$$= 45 \times 10^{9-5-6}/2.25$$

$$F = 20 \times 10^{-2}$$

$$= 20/100$$

$$= 0.2 \text{N}$$

$$\text{دفع کی فورس، مثبت چارجز}$$

$$F = 0.8 \text{N} \quad \boxed{13.3}$$

$$r = 0.1 \text{m}$$

$$k = 9 \times 10^9 \text{Nm}^2/\text{C}^2$$

$$F = kq_1q_2/r^2$$

$$0.8 = 9 \times 10^9 \times q^2 / (0.1)^2$$

$$q^2 = 0.8 \times 0.01 / 9 \times 10^9$$

$$= 8 \times 10^{-3} / 9 \times 10^9$$

$$= 0.888 \times 10^{-12}$$

$$\sqrt{q^2} = \sqrt{0.888 \times 10^{-12}}$$

$$q = 0.942 \times 10^{-6}$$

$$= 9.42 \times 10^{-7} \text{C}$$

$$F = 0.1 \text{N} \quad \boxed{13.4}$$

$$r = 5 \text{cm}$$

$$= 5/100$$

$$= 0.05 \text{m}$$

$$k = 9 \times 10^9 \text{Nm}^2/\text{C}^2$$

$$F = kq_1q_2/r^2$$

$$q^2 = Fr^2/k$$

$$= 0.1 \times (0.05)^2 / 9 \times 10^9$$

$$= 0.1 \times 0.0025 \times 10^{-9} / 9$$

$$q^2 = 2.8 \times 10^{-5} \times 10^{-9}$$

$$= 2.8 \times 10^{-14} \text{C}$$

2cm کے لیے کولمب فورس

$$r = 2 \text{cm}$$

$$= 2/100$$



$$= 0.02\text{m}$$

$$q^2 = 2.8 \times 10^{-14}\text{C}$$

$$F = kq_1q_2/r^2$$

$$= \frac{9 \times 10^9 \times 2.8 \times 10^{-14}}{(0.02)^2}$$

$$= (25.2/0.0004) \times 10^{-14}$$

$$= 63000 \times 10^{-5}$$

$$F = 0.63\text{N}$$

$$V = 10^4\text{V} \quad \boxed{13.5}$$

$$q = 100\mu\text{C}$$

$$= 100 \times 10^{-6}$$

$$= 10^{-4}\text{C}$$

$$V = W/q$$

$$10^4 = W/10^{-4}$$

$$W = 10^4 \times 10^{-4}$$

$$= 10^0$$

$$W = 1\text{J}$$

$$q = +2\text{C} \quad \boxed{13.6}$$

$$V_a = 100\text{V}$$

$$V_b = 50\text{V}$$

$$W = q(V_a - V_b)$$

$$= 2(100 - 50)$$

$$= 100\text{J}$$

$$V = 9\text{V} \quad \boxed{13.7}$$

$$Q = 0.06\text{C}$$

$$Q = CV$$

$$0.06 = 9 \times C$$

$$C = 0.06/9$$

$$= 6.67 \times 10^{-3}\text{F}$$

$$Q_1 = 0.03\text{C} \quad \boxed{13.8}$$

$$V_1 = 6\text{V}$$

$$Q_2 = 2\text{C}$$

مختلف ڈیٹا کے لیے بھی کیپسیٹنس دی

رہے گی کیونکہ کیپسیٹنس ایک ہی ہے

$$C = C$$

$$Q_1/V_1 = Q_2/V_2$$

$$V_2 = Q_2 \times V_1 / Q_1$$

$$= 2 \times 6 / 0.03$$

$$= 400\text{V}$$

$$C_1 = 6\mu\text{C} \quad \boxed{13.9}$$

$$C_2 = 12\mu\text{C}$$

$$V = 12\text{V}$$

$$1/C_{eq} = 1/C_1 + 1/C_2$$

$$= 1/6 + 1/12$$

$$= 4\mu\text{C}$$

سیریز میں تمام کیپسیٹرز پر چارج

ایک جیسا ہوگا

$$Q = C_{eq}V$$

$$= 4 \times 10^{-6} \times 12$$

$$= 48 \times 10^{-6}$$

$$= 48\mu\text{C}$$

$$V_1 = Q/C_1$$

$$= 48 \times 10^{-6} / 6 \times 10^{-6}$$

$$= 8\text{V}$$

$$V_2 = Q/C_2$$

$$= 48 \times 10^{-6} / 12 \times 10^{-6}$$

$$= 4\text{V}$$

$$C_1 = 6\mu\text{C} \quad \boxed{13.10}$$

$$C_2 = 12\mu\text{C}$$

$$V = 12\text{V}$$

$$C_{eq} = C_1 + C_2$$

$$= 6 + 12$$

$$= 18\mu\text{F}$$

پیرالل میں ہر کیپسیٹر پر پوٹینشل ایک

جیسا ہوگا

$$p.d = 12\text{V}$$

$$Q_1 = C_1V$$

$$= 6 \times 12$$

$$= 72\mu\text{C}$$

$$Q_2 = C_2V$$

$$= 12 \times 12$$

$$= 144\mu\text{C}$$

## CHAPTER # 14

Exp: 1, 2, 6, 7

$$I = 3\text{mA} \quad \boxed{14.1}$$

$$= 3 \times 10^{-3}\text{A}$$

$$t = 1\text{mints}$$

$$= 60\text{s}$$

$$I = Q/t$$

$$3 \times 10^{-3} = Q/60$$

$$Q = 60 \times 3 \times 10^{-3}$$

$$= 180 \times 10^{-3}\text{C}$$

$$(a) \text{ خشک جلد سے کرنٹ} \quad \boxed{14.2}$$

$$R = 100000\Omega$$

$$V = 12\text{V}$$

$$V = IR$$

$$12 = I \times 10^5$$

$$I = 12/10^5$$

$$= 1.2 \times 10^{-4}\text{A}$$

(b) گیلی جلد سے کرنٹ

$$R = 1000\Omega$$

$$V = 12\text{V}$$

$$V = IR$$

$$12 = I \times 1000$$

$$I = 12/1000$$

$$= 1.2 \times 10^{-2}\text{A}$$

$$R = 10\text{M}\Omega \quad \boxed{14.3}$$

$$= 10 \times 10^6\Omega$$

$$V = 100\text{V}$$

$$V = IR$$

$$100 = I \times 10^7$$

$$I = 100/10^7$$

$$= 1/10^5$$

$$= 1/10^2 \times 10^3$$

$$= (1/100) \times 10^{-3}$$

$$= 0.01\text{mA}$$

$$V = 10\text{V} \quad \boxed{14.4}$$

$$I = 1.5\text{A}$$

$$t = 2\text{mints}$$

$$= 120\text{s}$$

$$R = V/I$$

$$= 10/1.5$$

$$= 6.667\Omega$$

$$W = I^2Rt$$

$$= (1.5)^2 \times 6.667 \times 120$$

$$W = 1800\text{J}$$

$$R_1 = 2\text{k}\Omega \quad \boxed{14.5}$$

$$R_2 = 8\text{k}\Omega$$

$$V = 10\text{V}$$

$$(a) R_e = R_1 + R_2$$

$$= 2 + 8$$

$$= 10\text{k}\Omega$$

(b) سیریز میں ہر رزسٹنس پر

? نٹ ایک جیسا ہوگا

$$V = IR_e$$

$$10 = I \times 10 \times 10^3$$

$$I = 1 \times 10^{-3}$$

$$= 1\text{mA}$$

(c)

$$V_1 = IR_1$$

$$= 1 \times 10^{-3} \times 2 \times 10^3$$

$$= 2\text{V}$$

$$V_2 = IR_2$$

$$= 1 \times 10^{-3} \times 8 \times 10^3$$

$$= 8\text{V}$$

$$R_1 = 6\text{k}\Omega \quad \boxed{14.6}$$

$$R_2 = 12\text{k}\Omega$$

$$V = 6\text{V}$$

$$(a) 1/R_e = 1/R_1 + 1/R_2$$

$$= 1/6 + 1/12$$

$$= 4\text{k}\Omega$$

(b) پیرالل میں ہر رزسٹنس کے

کرد پوٹینشل ایک جیسا ہوگا

$$V = 6\text{V}$$

(c)

$$V = I_1R_1$$

$$6 = I_1 \times 6 \times 10^3$$

$$I_1 = 6/6 \times 10^3$$

$$= 1\text{mA}$$

$$V = I_2R_2$$

$$6 = I_2 \times 12 \times 10^3$$

$$I_2 = 6/12 \times 10^3$$

$$= 0.5\text{mA}$$

$$V = 220\text{V} \quad \boxed{14.7}$$

$$P = 100\text{W}$$

$$گھنٹے = 5\text{h}$$

$$\text{دن} = 30$$

$$t = 5 \times 30$$

$$= 150\text{h}$$

$$P = VI$$

$$= V(V/R)$$

$$P = V^2/R$$

$$100 = (220)^2/R$$

$$R = 48400/100$$

$$= 484\Omega$$

$$E = P \times \text{hours}/1000$$

$$= 100 \times 150/1000$$

$$= 15\text{kWh}$$

$$P = 150\text{W} \quad \boxed{14.8}$$

$$R = 95\Omega$$

$$P = VI$$

$$= V(V/R)$$

$$P = V^2/R$$

$$150 = V^2/95$$

$$V^2 = 150 \times 95$$

$$V^2 = 14250$$

$$\sqrt{V^2} = \sqrt{14250}$$

$$V = 120\text{V}$$

**14.9**

10 بلبلوں کے صرف شدہ پوٹنٹس

$$P = 10 \times 60 = 600\text{W}$$

$$t = 5 \times 30 = 150\text{h}$$

$$E_b = P \times h/1000$$

$$= 600 \times 150/1000$$

$$= 90\text{kWh}$$

4 پنکھوں کے صرف شدہ پوٹنٹس

$$P = 4 \times 75 = 300\text{W}$$

$$t = 10 \times 30 = 300\text{h}$$

$$E_p = P \times h/1000$$

$$= 300 \times 300/1000$$

$$= 90\text{kWh}$$

1 ٹی وی کے صرف شدہ پوٹنٹس

$$P = 1 \times 250 = 250\text{W}$$

$$t = 2 \times 30 = 60\text{h}$$

$$E_t = P \times h/1000$$

$$= 250 \times 60/1000$$

$$= 15\text{kWh}$$

1 اسٹری کے صرف شدہ پوٹنٹس

$$P = 1 \times 1000 = 1000\text{W}$$

$$t = 2 \times 30 = 60\text{s}$$

$$E_i = P \times h/1000$$

$$= 1000 \times 60/1000$$

$$= 60\text{kWh}$$

$$U_T = E_b + E_p + E_t + E_i$$

$$= 90 + 90 + 15 + 60$$

$$= 225\text{kWh}$$

$$\text{نیوٹن قیمت} = Rs = 4$$

$$\text{بل} = 4 \times 225 = 1020/-$$



14.10

بلب کے لیے کرنٹ، رزسٹنس

$$P = 100W$$

$$V = 250V$$

(a)

$$P = VI$$

$$100 = 250 \times I$$

$$I = 100/250 = 0.4A$$

(b)

$$V = IR$$

$$250 = 0.4 \times R$$

$$R = 250/0.4 = 625\Omega$$

ہیٹر کے لیے کرنٹ، رزسٹنس

$$P = 4kW = 4000W$$

$$V = 250V$$

(a)

$$P = VI$$

$$4000 = 250 \times I$$

$$I = 4000/250 = 16A$$

(b)

$$V = IR$$

$$250 = 16 \times R$$

$$R = 250/16 = 15.6\Omega$$

$$R = 5.6\Omega$$

14.11

$$V = 3V$$

$$I = 0.5A$$

(a) رزسٹر کے لیے پاور

$$P_r = I^2 R$$

$$= (0.5)^2 \times 5.6$$

$$= 1.4W$$

(b) بیٹری کے لیے پاور

$$P_b = VI$$

$$= 3 \times 0.5$$

$$= 1.5W$$

(c) کچھ پاور بیٹری کے اندرونی

رزسٹنس کی وجہ سے ضائع ہو جاتی ہے

## CHAPTER # 15

Exp: 1

$$V_p = 240V$$

15.1

$$V_s = 12V$$

$$N_p = 2000$$

$$N_s/N_p = V_s/V_p$$

$$N_s/2000 = 12/240$$

$$N_s = 12 \times 2000/240$$

$$= 100$$

$$N_p = 1$$

15.2

$$N_s = 100 \quad (\text{step-up})$$

$$V_p = 20V$$

$$N_s/N_p = V_s/V_p$$

$$100/1 = V_s/20$$

$$V_s = 100 \times 20/1$$

$$= 2000V$$

$$N_p = 100$$

15.3

$$N_s = 1 \quad (\text{step-down})$$

$$V_p = 170V$$

$$I_p = 1mA = 1 \times 10^{-3}A$$

$$N_s/N_p = V_s/V_p$$

$$1/100 = V_s/170$$

$$V_s = 1 \times 170/100$$

$$= 1.7V$$

ان پٹ پاور = آؤٹ پٹ پاور

$$V_s I_s = V_p I_p$$

$$1.7 \times I_s = 170 \times 1 \times 10^{-3}$$

$$I_s = 170 \times 10^{-3}/1.7$$

$$= 0.1A$$

$$V_p = 240V$$

15.4

$$V_s = 12V$$

$$N_p = 4000$$

$$I_s = 0.4A$$

$$N_s/N_p = V_s/V_p$$

$$N_s/4000 = 12/240$$

$$N_s = 12 \times 4000/240$$

$$= 200$$

ان پٹ پاور = آؤٹ پٹ پاور

$$V_s I_s = V_p I_p$$

$$12 \times 0.4 = 240 \times I_p$$

$$I_p = 12 \times 0.4/240$$

$$= 0.02A$$

$$P = 500MW$$

15.5

$$= 500 \times 10^6 W$$

$$V = 250kV$$

$$= 250 \times 10^3 V$$

$$P = VI$$

$$500 \times 10^6 = 250 \times 10^3 I$$

$$I = 500 \times 10^6 / 250 \times 10^3$$

$$= 2 \times 10^3 A$$

$$P_{gen} = 150kW$$

15.6

$$= 150 \times 10^3 W$$

$$V_{wire} = 10000V$$

$$R = 2\Omega$$

$$S = 5km$$

$$= 5000m$$

تار میں پاور جزیئر کی وجہ سے

$$P_{gen} = P_{wire}$$

$$150 \times 10^3 = V_w I_w$$

$$150 \times 10^3 = 10000 \times I_w$$

$$I_w = 150 \times 10^3 / 10000$$

$$= 15A$$

تار میں ضائع ہونے والا وولٹیج یا وولٹیج

ڈراپ

$$V_d = I_w R$$

$$= 15 \times 2 = 30V$$

تار میں ضائع ہونے والی پاور

$$P_{loss} = V_d I_w$$

$$= 30 \times 15 = 450W$$

شیر کے ٹرانسمارمر کو تار سے جو وولٹیج ملا

$$V_T = V_{in} - V_d$$

$$= 10000 - 30$$

$$= 9970V$$

## CHAPTER # 18

Exp: 1, 2, 4

$$T_{1/2} = 7.3s$$

18.1

آخری ہاف لائف تک دیا گیا عرصہ

$$T_p = 29.2s$$

$$T_p = n T_{1/2}$$

$$29.2 = n \times 7.3$$

$$n = 29.2/7.3 = 4$$

$$N = N_0/2^n$$

$$= N_0/2^4$$

$$= N_0/16$$

سولہ واں حصہ باقی رہ جائے گا

$$T_{1/2} = 5.25Y$$

18.2

$$T_p = 26Y$$

$$T_p = n T_{1/2}$$

$$26 = n \times 5.25$$

$$n = 26/5.25 = 5$$

$$N = N_0/2^n$$

$$= N_0/2^5$$

$$= N_0/32$$

تیس واں حصہ باقی رہ جائے گا

$$T_{1/2} = 5730Y$$

18.3

$$N = N_0$$

$$N = N_0/2^n$$

$$N_0/8 = N_0/2^n$$

$$1/8 = 1/2^n$$

$$2^3 = 2^n$$

$$n = 3$$

$$T_p = n T_{1/2}$$

$$= 3 \times 5730$$

$$= 17190$$

$$= 1.7 \times 10^4 Y$$

$$T_{1/2} = 6h$$

18.4

$$T_p = 36h$$

$$T_p = n T_{1/2}$$

$$36 = n \times 6$$

$$n = 36/6 = 6$$

$$N = N_0$$

$$= 200mg$$

$$N = N_0/2^n$$

$$= 200/2^6$$

$$= 200/64$$

$$= 3.12mg$$

$$T_{1/2} = 10mint$$

18.5

$$N_0 = \text{اصل مقدار}$$

$$= 368c/m$$

$$N = N_0/2^n$$

$$23 = 368/2^n$$

$$2^n = 368/23$$

$$2^n = 16$$

$$2^n = 2^4$$

$$n = 4$$

$$T_p = n T_{1/2}$$

$$= 4 \times 10$$

$$= 40mint$$

دو ہاف لائف کے بعد

$$T_p = 4mint$$

18.6

$$T_p = n T_{1/2}$$

$$4 = 2 \times T_{1/2}$$

$$T_{1/2} = 4/2 = 2mint$$

$$T_{1/2} = 1500Y$$

18.7

$$N_0 = \text{اصل مقدار}$$

$$= 32000c/m$$

$$N = N_0/2^n$$

$$N_0/16 = N_0/2^n$$

$$16 = 2^n$$

$$2^4 = 2^n$$

$$n = 4$$

$$T_p = n T_{1/2}$$

$$= 4 \times 1500$$

$$= 6000Y$$

$$T_{1/2} = 4000Y$$

18.8

$$t = 8h$$

$$C.R = 310, 300, 280,$$

$$270, 312, 305, 290$$

کاؤنٹ ریٹ میں بے ترتیبی ظاہر کرتی

ہے کہ اس کی ہاف لائف چار ہزار بہت

زیادہ ہے اور مشاہدہ کا نام آٹھ گھنٹے

بہت کم ہے

$$N_0 = \text{اصل مقدار}$$

18.9

$$N = N_0/2^n$$

$$T_{1/2} = 5730Y$$

$$N = N_0/2^n$$

$$N_0/8 = N_0/2^n$$

$$1/8 = 1/2^n$$

$$8 = 2^n$$

$$n = 3$$

$$T_p = n T_{1/2}$$

$$= 3 \times 5730$$

$$= 17190Y$$

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